

What is claimed is:

- 1 1. A method for treating one or more articles with a plasma generated from
2 dissociating one or more gases, said method comprising:
3 supplying one or more gases from a source to a first chamber, including a means
4 for controlling expansion of a plasma back through said source from said first chamber;
5 applying RF power to dissociate said one or more gases and create said plasma;
6 withdrawing said dissociated one or more gases from said first chamber through at
7 least one constriction, wherein said at least one constriction is sized to modify a power
8 density of said plasma near said at least one constriction; and
9 supplying said dissociated one or more gases to a second chamber containing said
10 one or more articles.
- 1 2. The method of claim 1, wherein a gas mixture is dissociated by the energy in said
2 dissociated one or more gases.
- 1 3. The method of claim 1, wherein supplying one or more gases to a first chamber
2 includes using one or more small openings to prevent expansion of said plasma back
3 through said source from said first chamber.
- 1 4. The method of claim 1, further comprising:
2 applying RF power to one or more gases in an additional chamber having a second
3 constriction to dissociate said one or more gases from a second source into a second
4 plasma prior to supplying said second plasma to said second chamber containing one or
5 more articles.

1 5. The method of claim 1, further comprising:
2 operating a plurality of plasma sources in parallel, wherein one or more plasma
3 sources of said plurality of plasma sources has at least one constriction with a selected
4 diameter.

1 6. The method of claim 1, wherein said at least one constriction is achieved by a
2 removable insert.

1 7. The method of claim 1, wherein said at least one constriction is achieved by an
2 insert including material chosen to react with said plasma to release one or more elements
3 into said plasma.

1 8. A method for treating one or more articles with plasma generated by dissociating
2 one or more gases, said method comprising:
3 supplying one or more gases from a first source to a first chamber;
4 applying RF power to dissociate said one or more gases from said first source to
5 create a first plasma;
6 withdrawing said first plasma from said first chamber through a first constriction;
7 supplying one or more gases from a second source to a second chamber for RF
8 power to dissociate said one or more gases from said second source to create a second
9 plasma;
10 using a second constriction to withdraw said second plasma from said second
11 chamber; and
12 supplying said first plasma from said first chamber and said second plasma from
13 said second chamber to a third chamber containing said one or more articles.

1 9. The method of claim 8, wherein said first chamber and said second chamber are
2 supplying said first plasma and second plasma in parallel to said third chamber.

1 10. The method of claim 8, wherein said first chamber and said second chamber are
2 supplying said first plasma and second plasma in series to said third chamber.

1 11. The method of claim 8, further comprising:
2 providing a removable insert in at least one chamber to achieve at least one
3 constriction and a higher power density in proximity to said removable insert.

1 12. The method of claim 8, further comprising:
2 positioning said first constriction and said second constriction in proximity to each
3 other to enhance said plasma released into said third chamber.

1 13. The method of claim 8, wherein at least one constriction is achieved by an insert
2 including material chosen to react with said plasma to release one or more elements into
3 said plasma.

1 14. An apparatus for dissociating one or more gases to produce a plasma, said
2 apparatus comprising:
3 a first chamber with at least one constriction, having a first port coupled to a first
4 source of one or more gases, including means for controlling expansion of a plasma in said
5 first chamber back through said first port,
6 one or more RF energy sources coupled to said first chamber,
7 means for dissociating said one or more gases in said first chamber into said
8 plasma, and
9 a second chamber coupled to said first chamber, wherein said second chamber
10 contains one or more articles.

1 15. The apparatus of claim 14, wherein said means for dissociating said one or more
2 gases includes a first inductor coupling RF energy to said one or more gases in said first
3 chamber.

1 16. The apparatus of claim 14, wherein said means for dissociating said one or more
2 gases includes a first electrode and a second electrode to capacitively couple RF energy to
3 within said first chamber for dissociating said one or more gases.

1 17. The apparatus of claim 14, wherein said means for controlling expansion of said
2 plasma in said first chamber back through said first port uses one or more small openings.

1 18. The apparatus of claim 14, wherein said at least one constriction is provided by at
2 least one removable insert.

1 19. The apparatus of claim 18, wherein said at least one removable insert includes
2 material that selectively reacts to release one or more elements into said one or more gases
3 during dissociation of said one or more gases.

1 20. An apparatus to dissociate one or more gases to produce plasma, said apparatus
2 comprising:
3 a first chamber with a first constriction, having a first port coupled to a first source
4 of one or more gases, including means for controlling expansion of a plasma in said first
5 chamber back through said first port,
6 a second chamber with a second constriction, having a second port coupled to a
7 second source of one or more gases, including means for controlling expansion of a plasma
8 in said second chamber back through said second port,
9 one or more RF energy sources coupled to said first chamber and said second
10 chamber,
11 means for dissociating said one or more gases from said first port into a first plasma
12 in said first chamber,
13 means for dissociating said one or more gases from said second port into a second
14 plasma in said second chamber; and

15 a third chamber coupled to said first chamber and said second chamber, wherein
16 said third chamber contains one or more articles.

1 21. The apparatus of claim 20, wherein said means for dissociating said one or more
2 gases includes a first inductor coupling RF energy to said one or more gases in said first
3 chamber.

1 22. The apparatus of claim 20, wherein said means for dissociating said one or more
2 gases from said first port into said first plasma in said first chamber is different to said
3 means for dissociating said one or more gases from second port into said second plasma in
4 said second chamber.

1 23. The apparatus of claim 20, wherein said means for dissociating said one or more
2 gases includes a first electrode and a second electrode to capacitively couple RF energy to
3 within said first chamber for dissociating said one or more gases.

1 24. The apparatus of claim 20, wherein said means for controlling expansion of a
2 plasma includes a material having one or more small openings.

1 25. The apparatus of claim 20, wherein at least one constriction is created by at least
2 one insert that is removable.

1 26. The apparatus of claim 25, wherein said at least one insert includes material that
2 selectively reacts to release one or more elements into said one or more gases during
3 dissociation of said one or more gases.

1 27. The apparatus of claim 20, wherein said first chamber and said second chamber
2 supply said first plasma and said second plasma in parallel to said third chamber.

- 1 28. The apparatus of claim 20, wherein said first chamber and said second chamber
2 supply said first plasma and said second plasma in series to said third chamber.